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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/815,291

03/30/2004

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7590

12/08/2005

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EXAMINER

THAI, LUAN C

ART UNIT

PAPER NUMBER

2891

DATE MAILED: 12/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/815,291

Applicant(s)

KONING ET AL.

Examiner

Luan Thai

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 September 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-34 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-34 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 8/19/04&10/1105.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant's election *without traverse* of Group I, claims 1-34, filed 9/26/05, is acknowledged.

Claims 35-56 are canceled.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims **1-34** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In fact, the recitation “*nanoclay*”, in claims 1-3, 11-13, 22-25 and 34, is not clear. The term “nanocomposite” is used in the literature for particle-filled polymers in which at least one of the dimensions of the dispersed particles is in the nanometer range. “Clay” can be virtually any fine inorganic powder. “Nanoclay” is therefore interpreted as an inorganic powder consisting of particles having at least one dimension in the nanometer range.

Furthermore, the term “aspect ratio” used in claims 1-3, 11-13, 22-25 and 34 is not clear because there has no well defined meaning for a three-dimensional object: it is not clear which two of the three dimensions are used to calculate the ratio.

Also, the relative term “high” used in claims 1, 11, 22-23 and 34 has no well-recognized meaning, thereby rendering the definition of the subject-matter of the claim unclear.

Finally, the term “about” used in claims 2-3, 12-13, and 24-25 is vague and unclear and leaves the reader in doubt as to the meaning of the technical feature to which it refers, thereby rendering the definition of the subject-matter of the claims unclear.

Claims 4-10, 14-21, and 26-33 are rejected since each includes the limitations of either independent claims 1, 11 or 23.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1, 4 and 10, insofar as being definite, are rejected under 35 U.S.C. 102(b) as being anticipated by Satsu et al. (US 2003/0030999 of record).

The figures and reference numbers referred to in this office action are used merely to indicate an example of a specific teaching and are not to be taken as limiting.

Regarding claims 1, 4 and 10, Satsu (see figure 17) discloses a nanocomposite inter-layer dielectric used in the multi-layer wiring board or module substrate (paragraph [0001]), wherein the nanocomposite comprises a nanocomposite including a polymer (4) having a plurality of nonoclay particles (6) dispersed therein, the nanoclay particles having a high aspect ratio and the shape of tactoids (see Fig. 17). Satsu further discloses the polymer binder comprising a thermally curable polymer (paragraph [0097]).

5. Claims 1, 5-9, 11, 15-19, and 22, insofar as being definite, are rejected under 35 U.S.C. 102(b) as being anticipated by Wakizaka et al. (US 2004/0025743 of record).

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Regarding claims 1, 5-9, 11, 15-19, and 22, Wakizaka discloses a nanocomposite (curable composition, paragraph [0111]) including a polymer (insulating resin, paragraph [0112]) having nano-particles dispersed therein, the nano-particles having a high aspect ratio (primary particles with average major axis from 0.001 to 5 microns, and an aspect-ratio of 5 or less, paragraph [0113]) to be used as an inter-layer dielectric or solder resist (paragraph [0117]). Wakizaka further discloses the nanocomposite may contain 0.1 to 50 parts by weight or particles per 100 parts of insulating resin (paragraph [0074]).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 14, 20, 21, 23, and 26-34, are rejected under 35 U.S.C. 103(a) as being unpatentable over Satsu et al. (US 2003/0030999 of record) in combination with Wakizaka et al. (US 2004/0025743 of record).

Regarding claims 14 and 20, Wakizaka discloses the claimed invention as detailed above except for the particles being tactoids and the polymer binder comprising a thermally curable polymer.

Satsu while related to a similar apparatus design teach (see specifically figure 17) a nanocomposite inter-layer dielectric used in the multi-layer wiring board or module substrate (paragraph [0001]), wherein the nanocomposite comprises a nanocomposite including a polymer (4) having a plurality of nonoclay particles (6) dispersed therein, the nanoclay particles having a

high aspect ratio and the shape of tactoids (see Fig. 17). Satsu further discloses the polymer binder comprising a thermally curable polymer (paragraph [0097]). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to form the polymer binder comprising a thermally curable polymer and the particles being tactoids since such structure are commonly used in the art as disclosed by Satsu, and such application is held to be within the ordinary designing ability expected of a person skilled in the art.

Regarding claims 23, 26-32, and 34, the proposed apparatus of Wakizaka and Satsu discloses all the limitations of the claimed invention as detailed above except for a die attached to and in electrical contact with the contact surface of the substrate.

Although the proposed apparatus of Wakizaka and Satsu does not explicitly disclose a die to be attached to and in electrical contact with the contact surface of the substrate, this citation is taken to be inherent in the proposed apparatus of Wakizaka and Satsu because the multi-layer wiring board or substrate with a nanocomposite solder resist layer on the contact surface is disclosed and it is apparent that some type of chip or die must be attached and electrically connected to for the substrate to function as intended.

Regarding claims 21 and 33, since the proposed apparatus of Wakizaka and Satsu does disclose the thermally curable polymer, the use of a radiation curable polymer is an obvious alternative to a thermally curable polymer for the skilled person.

8. Claims 2-3, 12-13, and 24-25, are rejected under 35 U.S.C. 103(a) as being unpatentable over Satsu et al. (US 2003/0030999 of record) and Wakizaka et al. (US 2004/0025743 of record) as applied to 1, 11 and 23 above, and further in view of Kobayashi et al. (EP-A-0873047 of record).

Regarding claims 2, 12, and 24, the proposed apparatus of Wakizaka and Satsu discloses the claimed invention as detailed above except for the particles having an aspect ratio greater than about 50.

Kobayashi while related to a similar apparatus design teach a nanocomposite inter-layer dielectric (insulating varnish for producing a multi layered printed circuit board) including a polymer (resin component, page 5, lines 55+) having a plurality of nanoclay particles (whiskers, page 5, lines 6-7 with a diameter from 0.3 to 3 microns) dispersed therein, the nanoclay particles having a high aspect ratio (length up to 50 microns, resulting in an aspect ration up to 166). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to recognize that the particles having an aspect ratio greater than about 50 could be applied in the proposed apparatus of Wakizaka and Satsu since such aspect ratio is common in the art as disclosed by Kobayashi.

Regarding claims 3, 13, and 25, the subject matter of these claims differs from the proposed apparatus of Wakizaka, Satsu and Kobayashi, above in that the aspect ration of the nanoclay particles is 200 or higher. The incorporation of particles with a high aspect ration results in the provision of a resin composition which has reduced mold or die shrinkage factor and linear expansion coefficient, satisfactory dimensional stability, improved heat resistance and mechanical strength. The problem to be solved can thus be regarded as improving any of the above mentioned material properties. The solution proposed in claims 3, 13, and 25 cannot be regarded as inventive because it has been disclosed already with the same advantages. Note that Kawaguchi et al. (EP-1479729), which discloses a nanocomposite for a circuit board comprising nanoclay particles (clay, paragraph [0023], 0.05-1 micron thick, paragraph [0015]) in a resin

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composition (paragraph [0015]), the nanoclay particles having an aspect ratio of up to 200 (Table 1, example 7), is cited to support the statement above.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luan Thai whose telephone number is 571-272-1935. The examiner can normally be reached on 6:30 AM - 5:00 PM, Monday to Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bradley W. Baumeister can be reached on 571-272-1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Luan Thai

Primary Examiner

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December 6, 2005